

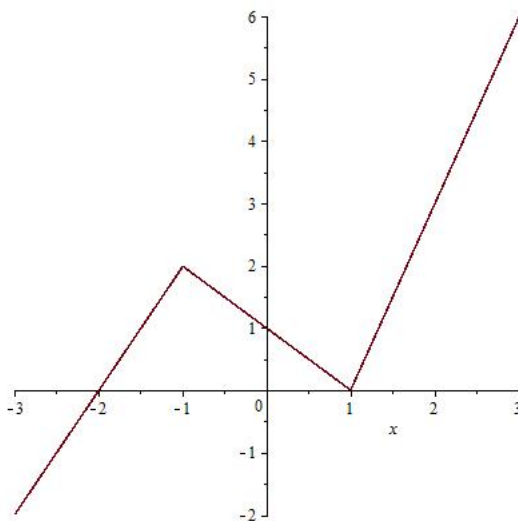
## Math 180 Written Homework

### Assignment #4

Due **Tuesday, September 23rd** at the beginning of your discussion class.

Directions. You are welcome to work on the following problems with other MATH 180 students, but your solutions must be hand-written, by your own hand, representing your understanding of the material. Word-by-word copying from another student or any other source is unacceptable. Any work without the proper justification will receive no credit. The list of problem solutions is to be submitted to your TA at the beginning of the discussion class listed above. No late homework will be accepted.

1. The following graph represents the graph of some function  $f(x)$ . Sketch a graph of  $f'(x)$  on the interval  $-3 \leq x \leq 3$ . Note: The vertices of the graph of  $f$  and the endpoints of the figure all have integer coordinates.

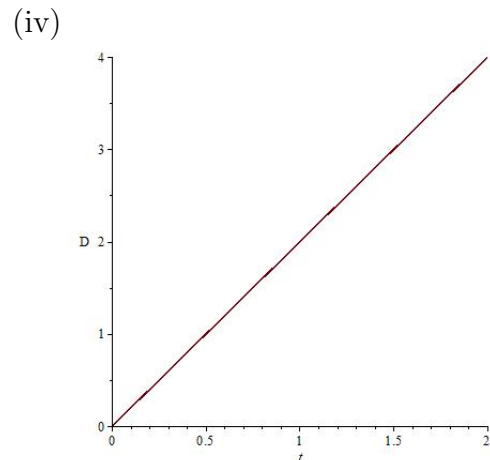
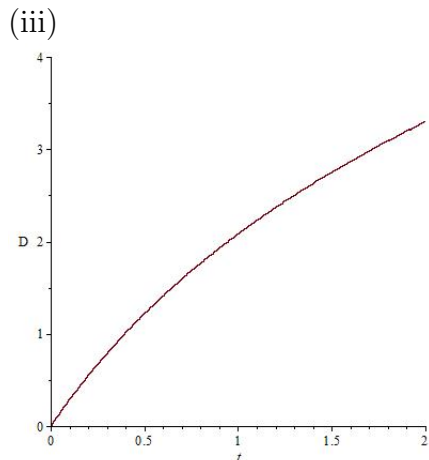
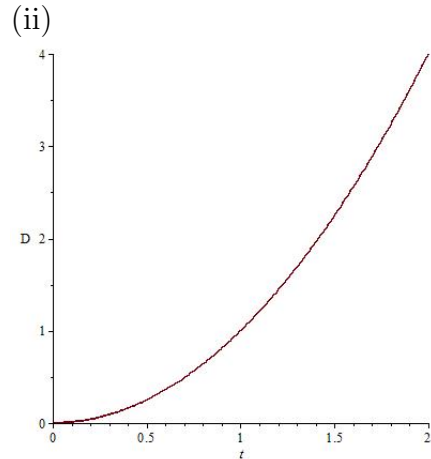
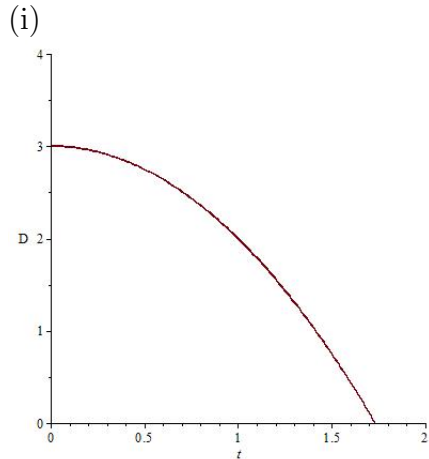


2. Write the equation of the tangent line to  $f(x) = 4x^3 + 2x - 1$  at  $x = -1$ .
3. If the tangent line to  $y = f(x)$  at  $(4, 3)$  passes through the point  $(0, 2)$ , then
  - (a) find  $f(4)$  and  $f'(4)$ ; and
  - (b) write the equation of that tangent line.
4. Sketch the graph of a function  $g$  for which  $g(0) = 0$ ,  $g'(0) = 3$ ,  $g'(1) = 0$ , and  $g'(2) = -1$ .
5. Let  $f(x) = |\sin x|$ . Use the definition of the derivative to find  $f'(0)$  or show that  $f'(0)$  does not exist.

6. Each of the graphs below represent some function  $f$ . Use the graphs to answer the following questions and explain why you chose the answer you did.

(a) In which graph is  $f'$  increasing the fastest?

(b) In which graph is  $f'$  a constant?



7. Calculate the following derivatives.

(a)  $x^6 - 4x + 3$

(b)  $\frac{\sqrt{x} - 1}{\sqrt{x} + 1}$

(c)  $x \sin x$

(d)  $\cos^3 x$  [Note: You may not use the “Chain Rule” if you know it.]

(e)  $\frac{\tan x}{x}$

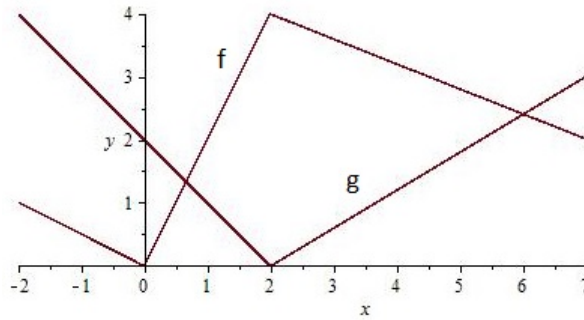
(f)  $\frac{x \cot x}{\sec x}$

(g)  $3x^2 + 5e^x$

8. If  $f$  and  $g$  are the functions whose graphs are shown, let  $u(x) = f(x) \cdot g(x)$  and  $v(x) = f(x)/g(x)$ . Note: The vertices of the graphs of  $f$  and  $g$  and the endpoints of the figure all have integer coordinates.

(a) Find  $u'(1)$ .

(b) Find  $v'(5)$ .



9. If  $f(x) = -\cos x$ , find  $f^{(100)}(x)$ . Explain how you found your answer.
10. Find the point(s) on the curve  $y = \frac{\cos x}{2 + \sin x}$  whose  $x$ -coordinate satisfies  $0 \leq x \leq 2\pi$  at which the tangent line is horizontal.